ON A SUPPOSED CASE OF PARALLELISM IN THE GENUS PALAEOSYOPS.

By Charles Earle.[1]

The object of the present paper is to attempt to show that in the extinct perissodactyle Palaeosyops, the species developed at least two parallel series, both of which may have lead to some permanent result. In other words, from a very thorough study of the known species of this genus, I am lead to the conclusion that the genus Titanotherium may have had a polyphyletic origin. This will be impossible to prove until we know more of that intermediate form *Diplacodon.*

Little has been attempted in the construction of the phylogenies of species of fossil mammals, although a great deal has been done in this respect in regard to genera. I attempted it in my "Memoir on Palaeosyops," but the recent acquisition of new material proves that I made some mistakes in my phylogenetic scheme. As our knowledge of Palaeosyops now stands, we know considerable about the structure of the skeleton in a number of well defined species, and in some cases the complete osteology is known.

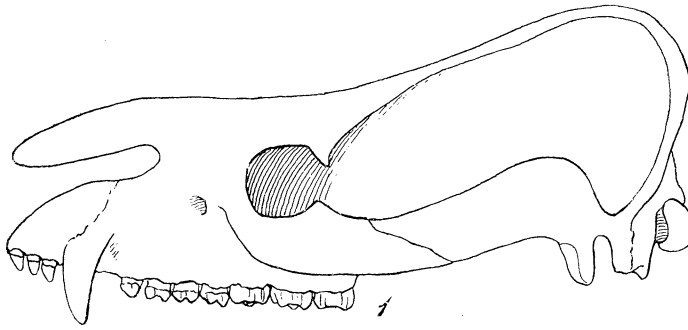
Professor Cope was one of the first to call attention to the phenomenon of the parallelism of genera. Professor Scott[2] in his series of valuable papers has placed before us a thorough exposition of what we have to attempt in paleontological investigation, and especially the relation of the latter to the facts of evolution. In the "Deep River Mammals" he remarks[3] "only very rarely can we construct a phylogeny of species as distinguished from that of genera, and the latter are too vague for the purpose."

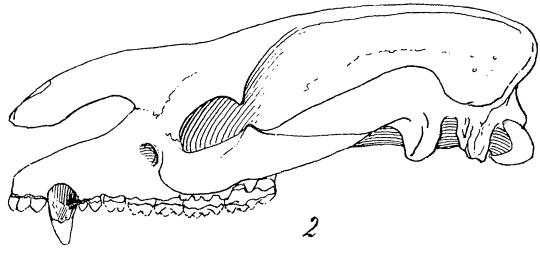
[1] American Museum of Natural History, New York.

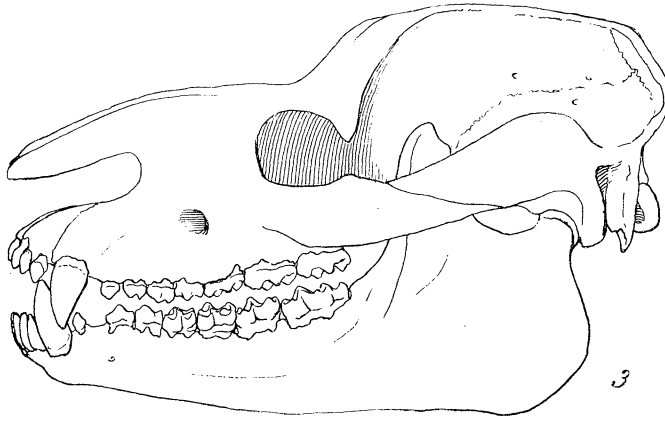
[2] Phylogeny of the Tylopoda. Journal of Morphology, Vol. p. .
Osteology of Mesohippus and Leptomeryx. Journal of Morphology. Vol. V, p. 301.
The Mammalia of the Deep River Beds. Proc. Am. Phil. Soc., 1894.

[3] Page 119.

PLATE XXVII.







Earle on Palaeosyops.

Quite a large number of species of Titanotherium have been already described, but as a whole this genus is remarkably homogeneous in the characters of the species, and it is very uncertain how many there really are. The deeply concave or saddle-shaped skull is typical, I believe, of all the known species. The case with Palaeosyops is quite different, as this genus exhibits a great variety in its specific forms, fully as great, if not greater than Palaeotherium of the Middle Eocene of Europe.

Within the past summer some exceedingly valuable material of Palaeosyops has been collected for the American Museum of Natural History by Mr. O. A. Peterson of the Museum; and this has just been described in bulletin form by Professor Osborn. We are greatly indebted to this bulletin for its important information in regard to the stratigraphical relations of the skulls of Palaeosyops. This material was collected in the country just south of the Uinta Mountains, and the deposit which occurs in this area was always supposed to pertain only to the Uinta or Upper Eocene. Mr. Peterson discovered skulls of a species of Palaeosyops in this region, namely, *P. megarhinus*, which is typical of the Bridger proper, and, in fact, he found one skull of this species or a variety of the same, which is the earliest one known of this form. This skull came from the base of the beds under the Uinta, which is considered to be the bottom of the Bridger. Mr. Peterson informs me that Palaeosyops occurs from this position in the beds as far up as just beneath the Uinta proper. Furthermore, in the uppermost of the transition beds, between the Bridger and Uinta proper, Mr. Peterson discovered a number of large skulls of a supposed new type of Palaeosyops, but I think I can quite safely say that this form really belongs to the genus *Telmatotherium* Marsh (*Leurocephalus* S. & O.). The characters of these skulls nearly demonstrate my views as to the phylogenetic relationship of Palaeosyops to Telmatotherium, and in my memoir on the former genus I remarked "I consider that Telmatotherium is the most highly specialized genus of the Palaeosyopinae approaching more closely in its dental characters (skull unknown at that time) to Diplacodon than any other genus of

the subfamily, Telmatotherium should, therefore, hold an intermediate position between Palaeosyops and Diplacodon."

It is interesting to note that these newly discovered skulls of Telmatotherium are merely greatly enlarged ones of the *P. megarhinus* type (see fig. 2), and that other skulls in the collection of the American Museum show the transition stages between the generalized form of *P. megarhinus* and that of the Telmatotherium type from the uppermost part of the transition beds already referred to.

In the Bridger proper or the area of southwestern Wyoming, just north of the Uinta Mountains, occur at least three well defined types of skulls of Palaeosyops, namely, that of *P. paludosus*, with frontal region strongly convex and occipital portion broad and heavy (see fig. 3). The character of the teeth in this species is very primitive, but it has a specialized form of skull.

2. The type which Marsh called Limnohyops. I recognized this as a good genus in my memoir, but I now believe that it should be included in Palaeosyops. In *P.* (*Limnohyops*) *laticeps* the skull is saddle-shaped like that of Titanotherium, and I called particular attention to this fact in the paper already quoted (see fig. 1).

3. The *P. megarhinus* type of skull is the most primitive of all, there is hardly any depression on the dorsal surface, and the sagittal crest is well defined. The teeth are tending towards those of Telmatotherium, as they have broad and angular crescents, with a reduction of the intermediate tubercles (see fig. 2). I wish to emphasize particularly that in the Bridger proper, the saddle-shaped type of skull was established, and contemporaneous with it was the much more primitive skull of *P. megarhinus*. I accordingly did not suspect that the latter was in the direct line leading to Diplacodon. However, the discovery of the skull of this species south of the Uinta Mountains and its relationship to Telmatotherium, has made necessary some changes in the phylogeny of the species of Palaeosyops, and I now find that there were two well defined lines of Palaeosyops tending in the characters of their skulls and dentition towards Titanotherium, and that these two

series were parallel in many of their characters, although the *P. megarhinus*-Telmatotherium division did not commence to differentiate those characters which are found in Titanotherium as early as the *P. laticeps*-*P. vallidens* series.

In the following table I have arranged some of the species of Palaeosyops phylogenetically and in three parallel columns, two of which are supposed to contain persistent types. The third column contains the more specialized species, which are are supposed to have died out.

In conclusion I wish to emphasize the following points:—

The first series exhibits transition in the structure of the the teeth and skull which is quite gradual, although in the most highly differentiated form of this line, namely, Telmatotherium sp. nov. (type specimen in American Museum collection), the dorsal contour of the skull is slightly convex and not saddle-shaped as in Titanotherium. This series began to differentiate later, as already shown, than the second series; this is proven by the presence in the Bridger proper of the supposed earliest members of the two lines, namely, *P. megarhinus*, which has a skull with a nearly straight dorsal contour, and the ancestor of the second line, namely, *P. laticeps*, with a skull which is deeply concave like that of the White River genus Titanotherium.

2. The changes from *P. laticeps* to *P. vallidens* parallels that of the first series in many ways, notably the increased height of the crowns of the molars, reduction of the intermediate tubercles, increase in size of the skull, and lastly some indications of the development of horns.

3. The great variety of species occurring in the genus Palaeosyops indicates progression and advancement towards a higher type, although we observe that a number of the species probably left no descendants. In the genus Titanotherium, which was approaching extinction, we see fewer well marked species and much closer similarity between them than between those of Palaeosyops.

TABLE.

Parallel Series I. Persistent Types.	Parallel Series II. Persistent Types.	Specialized Forms. Non-persistent.
1. *P. megarhinus* (variety) Earle. Skull small, sagittal crest long and high. Last superior molar with hypocone. From base of Bridger.	1. *Palaeosyops* (*Limnohyops*) *laticeps* Marsh. Skull saddle shaped as in *Titanotherium*. Zygomatic arch strong and robust. Nasals long and slender. Superior molars with short crowns and well developed intermediate tubercles. Last upper molar with hypocone. Bridger Proper.	*Palaeosyops paludosus* Leidy. Skull short and broad, with frontal region strongly convex. Teeth primitive, with low crowns and well developed intermediate tubercles. Bridger Proper.
2. *P. megarhinus* Earle. Skull larger, sagital crest not as prominent and long. No frontal depression. Molar insertion strongly depressed, zygomatic arch narrow and slender as in Diplacodon. Nasals elongated and broad distally. Molar crowns tending to become elongated and intermediate tubercles reduced. From the Bridger Proper.	2. *Palaeosyops vallidens* Cope. Skull saddle-shaped and much larger than the above species. Zygomatic arch not depressed at the molar insertion and rising gradually from the cheek. Molar crowns not as high and angular as in *Telmatotherium*, but show a reduction of intermediates. Last superior molar with hypocone rudimentary. Rugosities at junction of frontals and nasals, ? incipient horns. Washakie Eocene.	*Palaeosyops* (*Limnohyops*) *fontinalis* Cope. A small species with molars of the Telmatotherium type, namely, with rather high crowns, angular crescents, with hypocone on M 3 as large as protocone. Bridger Proper.
3. *Telmatotherium cornutum*, Osborn. Type in American Museum. Skull twice as large as former species. No sagittal crest, frontal region slightly convex and temporal ridges widely separated. Character of molar and zygoma, as well as nasals, the same as in *P. megarhinus*. Molars with crowns high and crescents more angular, no intermediate tubercles. Indications of incipient horns. Transition beds of Bridger, just below the Uinta proper.	*? Telmatotherium hyognathus S. & O.* This species is represented by a large jaw in the Princeton collection. Generic reference uncertain. Washakie.	